Decoding Online Learning: Exploring Educational Taxonomies for Virtual Instruction

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Abstract

It is crucial for many researchers to examine the critical issues involved with understanding the nature and function of prescriptive educational taxonomies for improving the efficiency and effectiveness of rigorous instructional design solutions adaptable and applicable to the growing field of Online learning, user-centered design, and technologically distributed distance learning environments. The key aim of this paper is to look at various educational taxonomies specifically available in literature and determine the most suitable and relevant taxonomy particularly in Online instruction to attain the learning objectives. Extensive literature review was made to get familiarity with various taxonomies and it was observed that a long list of educational taxonomies is available in literature such as Bloom's original taxonomy (1956) which is revised by Andeson & Krathwohl in 2001, Gegne (1977), Merrill (1983), and Simpson and Harrow (1972). Among all of these no one is considered as appropriate for designing and planning instruction for Online education. In 2007 Bloom's Digital taxonomy appears on the canvas of educational taxonomies that is known as most suitable and relevant taxonomy specifically in the field of Online instruction.

Keywords: Typology of educational taxonomy, Bloom's taxonomy, Bloom's revised taxonomy, Bloom's digital taxonomy, online instruction

Introduction

Online instruction is successfully providing opportunities of learning to individuals in variety of situations but the quality of such instruction is the key issue among many educationists. Concern about the quality of distance programs is important as this approach of teaching is very different from traditional one. The distance educationists have to adapt various teaching styles, get understanding of growing technological needs, and perform effectively as a skilled facilitator and content provider in the teaching learning environment (Filcher & Miller, 2000) that demands specific training regarding models, principles and teaching techniques and designing instructional/educational objectives which are widely discussed and considered as important factors for the successful accomplishment educational activities. It is worldly recognized that educational objectives are much more than mere learning the knowledge and thinking (Ugur et al., 2015). Instead of this now it involves students, beliefs, feelings and cultural environment. However, we cannot deny the importance of teaching thinking and creativity. The taxonomy of educational objectives is a system/standard of classifying educational/learning objectives that gives administrative configuration which provides a commonly comprehend meaning to objectives that are classified in one of its (McGrath & Willcutt, 2022; Osters & Tiu, 2015)

Various researches have examined the critical issues involved with understanding the nature and function of prescriptive educational taxonomies for improving the efficiency and effectiveness of rigorous instructional design solutions adaptable and applicable to the burgeoning field of online learning, user-centered design, and technologically distributed distance learning environments (Al Maani & Shanti, 2023; McNeil, 2011). The purpose of this research is to review the existing literature about Educational Taxonomies available on various database and libraries to summarize the available educational taxonomies and to introduce an appropriate and more relevant Taxonomy of learning especially for online instruction.

Objectives

The objectives of this paper are to:

1. identify a theoretical framework to classify educational Taxonomies
2. explore relevant educational taxonomy for online instruction.

Research questions

1. What kinds of theoretical framework of taxonomies have been established among researchers in education?
2. Which educational taxonomy could be appropriate for online instruction?
3. How does Bloom's digital Taxonomy cope with the 21st century learners' skills?

Methodology of Research

An extensive library and web resources research such as Google Scholar, ERIC, JSTOR and Emerald were explored to obtain relevant data to identify a comprehensive theoretical framework for educational taxonomies and determine the most appropriate taxonomy

especially for distance learning instruction.

Review of Related Literature

How students are taught and learned is the key issue and it is the time to focus on how students are educated and are able to recall of facts (Ellis, 2016). Studies are repeatedly conducted to examine the impact of instructional or contextual variables e.g. organizational, environmental, cultural, and situational on learning outcomes. However, the lack of established criteria for learning outcomes and empirical findings about their co-relational or causal relationships with other work-affecting variables, such as learning motivation, learning presence, learning transfer, and work performance contributes to a cynicism about learning as a less justifiable investment. Generally, in distance /online instruction, educational courses are so challenging and different that demands excessive assistance and training in delivery of the course. Most of time, distance learning is considered as fraught with novel challenges and demands. Online students are engaged in multi-tasks of family commitments and coordinating various jobs (Hattie J. , 2013). Additionally, distance/ online students have limited one to one encounter with teachers and whole teaching learning system that demands to focus upon specified learning strategies to empower the learners. These learning strategies may involve special thoughts and behaviors that can influence the abilities of learners to select, gain, organize, and integrate new knowledge (Howell, Roach, & Clark, 2003). According to Pintrich (1988), a plenty of taxonomies are available that help to classify and describes students learning strategies. Benjamin Bloom was the first who created a hierarchy of thinking skills presenting them in continuum from lower thinking level to higher thinking level (Singh et al., 2016). According to this thinking hierarchy low ordered skills involve just recall knowledge to label, name or identify things, whereas higher order skills include application, analysis and synthesis of knowledge. Bloom's structure was widely used as starting point for deciding school activities and curricula (Akash , 2016).

Taxonomies of Educational Objectives

The educational objective taxonomy is a framework that is used to classify the expectation about students' learning after getting the instruction. The taxonomies help the faculty of various universities to exchange various test items among each other and create test items bank. Among the taxonomists Benjamin Bloom, initiated the idea of preparing the test items bank to minimize the efforts involves in preparing the final comprehensive examinations (Huang & Hu, 2015). This work of Bloom is known as original Taxonomy of educational objectives that was just a measuring tool that he believes is a common language about leaning objectives and can assist people to communicate with each other about learning outcomes, subject matters and various grade levels (Yanchinda et al., 2016). These are considered as source for identifying the instructional objectives, activities, and assessments for a unit, course or curriculum (Lehmann & Mehrens, 1991). Various educational psychologists encouraged to determine educational objectives using Taxonomies. Because these classified educational objectives can provide assistance in communication of educational objectives and to understand the relationships among them (Lehmann & Mehrens, 1991). The original plan the classification of educational objectives was based on main three domains; Cognitive Domain first published in 1956 by Bloom, the Affective domain in 1964 by Krathwohl, and

the Psycho motor domain in 1972 by Simpson and Harrow (Harden, 2002).
Various descriptive taxonomies have been developed in educational perspective and furnished rich organizational schema for describing various procedures, events and methods for effective instruction. Much of importance is given to affective and psychomotor domain even by traditional instructional designers who adopted these all three domains while determining their objectives and assessment tools which were generally just focused on only cognitive domain. Although there have been critical efforts to revise and replace Bloom's Taxonomy with the applied focal point towards more particular and pragmatic "fine apply" teaching procedures in instruction (Krathwohl, 2002). Nevertheless, little correspondingly prescriptive taxonomy has emerged to encompass the most advantageous design solutions for distance schooling and online e-learning professions. Below is provided a hierarchy of various educational taxonomies that have seen over the canvas of educational taxonomies.

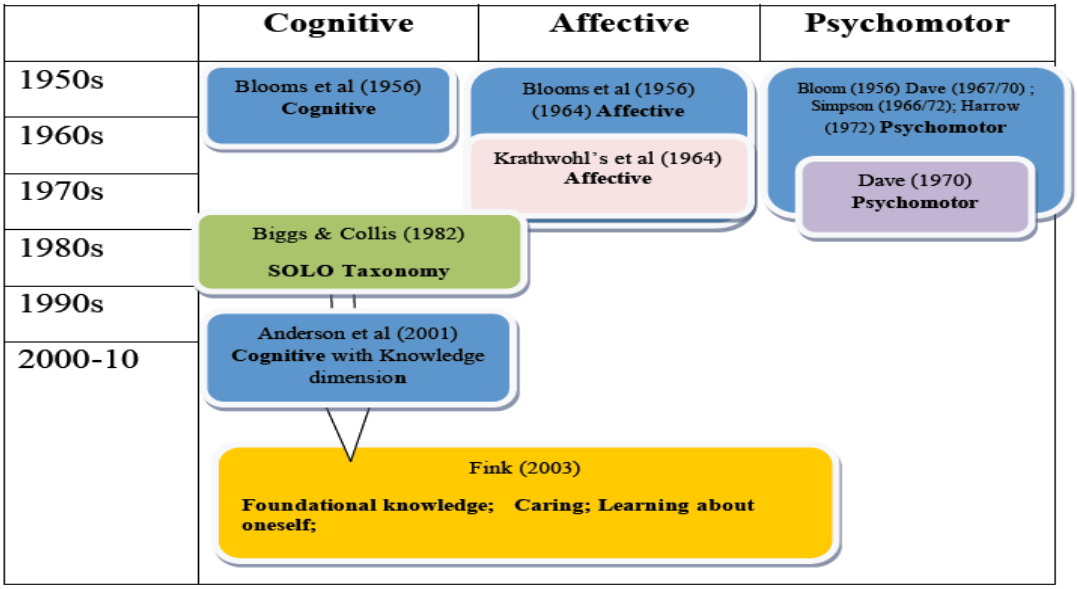

Figure 1: Overview of development of Taxonomies and their domains
Resource: (O'Neill & Murphy, 2010)

Bloom's Original and Revised Taxonomy
Bloom's original taxonomy of cognitive domain was based on cognitive levels of learning representing more noun words than the verbs such as knowledge, comprehension etc (Stanny, 2016). whereas the revised Bloom's taxonomy developed in 2001 by a student of Bloom, Lorin Anderson, and his group of cognitive psychologists, representing more action verbs related to the cognitive domain instead of using simple nouns and replace old noun terms with the latest action verbs as knowledge is replaced with remembering and similarly in the place of comprehension the action verb understanding is introduced (IACBE , 2016).

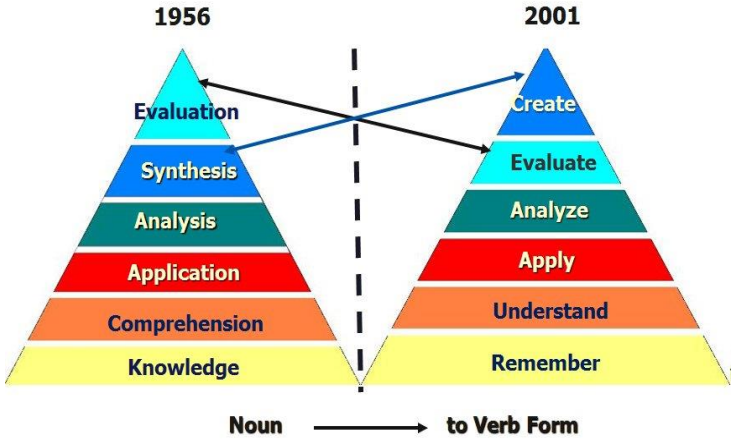

Figure 2: Revised Bloom's Taxonomy

Source: (Wilson, 2016)

Bloom's revised Taxonomy is considered more pertinent to 21st century skills of students and possesses significant modification in basic structure and terminology of Bloom's original Taxonomy. This involves more action verbs instead of simple noun words. Moreover, three of cognitive levels are renamed and two of higher order levels are interchanged. This revised taxonomy reflects a more dynamic framework and model for the classification of cognitive processes in acquiring and utilizing knowledge by the students and covers many target behaviors and activities. In spite of its practicality and popularity many educationists criticized its ineffective use for fulfilling the demands regarding integration of technologies, new knowledge and verbal exchange applied into classrooms and lives of 21st century students (Soto, 2014).

Critique of Bloom's Old Taxonomies

The major critics about the Bloom's Taxonomy are that it emphasizes only on rehearsing of the information. This does not help students and instructors to go deeper with learning e.g., a student can give surface level answers for a critical question or a deep answer for a simple question but the Bloom's Taxonomy does not give space for such type of learning. Furthermore, it does not favor a student to take control on their own learning. One more criticism about this taxonomy is that it is not based on any well-known teaching learning theory (Didau, 2012). Despite of the fact that Blooms Taxonomy has some limitations, current revisions and overwhelming uses of this taxonomy depicted its capacity for endurance the test of time. Cecelia Munzenmaier has discussed in the work titled "What's Old in New Again, the history, revisions of Bloom's Taxonomy and its uses and she argued why it Bloom's Taxonomy is alive regardless of its wide criticism. She discussed that it can be effectively used for helping instructors while designing their instruction and developing assessment tools (Munzenmaier & Rubin, 2013).

Bloom's Digital Taxonomy

The latest version of Bloom's Taxonomy deserves a special note regarding its less

complicated nature to achieve exactly required efficiency of the learners. This new version is consisting two dimensions such as knowledge and cognitive techniques. These two have subcategories which are wider in nature and have more relevancies. In this version, the more emphasis on cognitive processes overcomes the weakness in original version of Bloom's Taxonomy. The person who presented this version of Bloom's Taxonomy is Andrew Churches, who updated this version by incorporating digital technologies and 21st century digital skills (Holovatenko, 2023; Roberts, 2011).

Andrew Churches made minor changes in Bloom's Taxonomy in 2009 and developed a more sophisticated form of Blooms Taxonomy that is named as 'Bloom Digital Taxonomy'. This is aligned with 21st century learning skills and tried to fulfill demands of new era. Following is the diagram proposed by Andrew Churches to summarize Bloom's Digital Taxonomy:

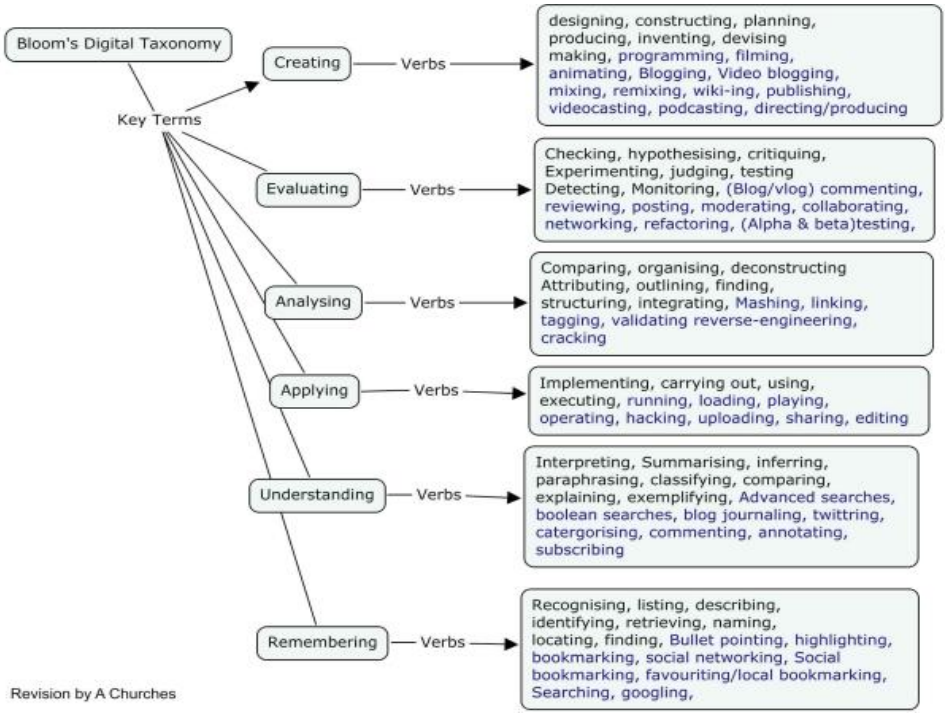

Figure 3: Bloom's Digital Taxonomy

Note: (New 'digital verbs are highlighted in blue color)
Source: (Roberts, 2011)

Use of Bloom's Taxonomy for 21st Century Learning Skills

Bloom's Digital Taxonomy involves both the cognitive processes highlighted by Bloom and Anderson & Krathwohl, and moreover it possesses tools and methods required for actual Online learning. This suggests various ambitions and sufficient findings that are important in a technology enhanced teaching environment, moreover it explores different methods to transfer targeted skills. Here a graphic illustration of Blooms Digital Taxonomy is presented covering the cognitive elements and approaches required for using internet and various technologies (Abalkheel, 2022; Holovatenko, 2023).

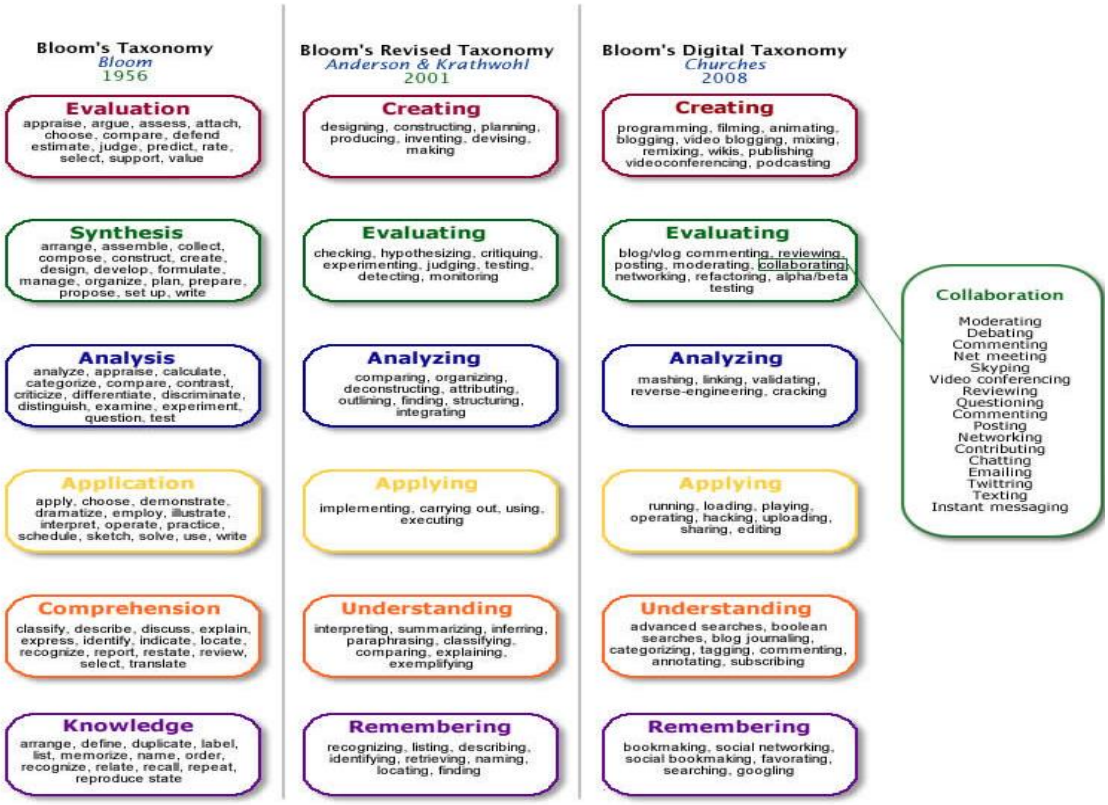

Figure 4: Typology of Bloom's Taxonomy

Source: (Munzenmaier & Rubin, 2013)

Collaboration is incorporated as a separate element on the grounds that it is as a rule addressed/mentioned unbiased of the mechanisms used to collaborate. While collaboration just isn't a critical a part of the learning process for the individual, you doing so commonly enhances finding out. It is also important to note that collaboration is a skill of increasing significance in the trade atmosphere and gaining importance within the learning process (Wang, Wei et al., 2017). Each of the taxonomic phases is supported by way of a sizeable record of seeing that abilities tailored to a science-more suitable instructing and studying environment. For instance, Anderson and Krathwohl's taxonomy developing can also be outlined as placing the factors at the same time to sort a coherent or intelligent complete; reorganizing factors right into a company new sample or structure via producing, planning or producing (Sweet et al., 2016). The separate pondering expertise which may be realized within the context of technological know-how-extra positive classes can also be designing, developing, planning, devising, programming, mixing, inventing, webbing, publishing, video casting, constructing, video running, wikiing, directing, producing and compiling mash-up.

Remembering

Remembering involves dealing of retrieval of material. It links with expansion of information and knowledge. The digital additions and explanations involve:

- **Highlighting:** this is a significant part of most output suits; encourage learners to select and highlight key words and sentences that help them to recall information.
- **Bullet pointing:** this is a digital format and an analogous to listing
- **Book marking:** this is used to mark various web sites, resources and files for later use
- **Social bookmarking:** this is an online bookmarking of favorite sites and involves high order thinking like cooperation and sharing skills. This is simplest type of listening sites which are saved as online format.
- **Social networking:** this is used for networking with friends and collogues, creating linkage with different people and as key for collaboration and networking.
- **Searching/Googling:** used as key element for research purpose. Students just enter certain key words into research bar and get a lot of relevant data and information.

Understanding:

Some digital tools related to understanding and explanations are discussing below:

- **Blog journaling:** this is an easy way of use web publication, a place where learners talk, write, or type on any topic. This is utilized to increase higher level thinking when used for collaboration or decision making.
- **Advance and Boolean looking:** here students require skills for finding out, create, adjust, and refine data research related to their demands.
- **Twittering:** this is about 'what are you doing' which is described in two or three words but it can assist to develop collaboration and understanding when used as a tool.
- **Commenting and annotating:** there are various tools are available that allows its users to remark and annotate on websites as pdf and other documents. The students can continue third work easily by commenting on the pages.
- **Categorizing:** organizing and classifying records, digital classification and organizing websites and substances utilizing folders.
- **Subscribing:** it involves bookmarking in the simple style and studying one degree extra. This does not exhibit or strengthen the understanding but frequently reading and visiting the subscribed to feeds results in higher understanding.

Applying

- **Playing:** the emergence of video games as an instrument for education leads the development of this term. The pupils who operate games can demonstrate understanding and application abilities.
- **Running and operating:** this requires beginning of a program, operate and control hard ware and apply to achieve a common goal.
- **Hacking:** this is a less complex type of using rules to achieve common objectives.
- **Uploading and sharing:** uploading of material and sharing it via websites as fliker etc. this is used as easy type of collaboration and higher-level thinking skill.
- **Editing:** editing is a method or process that editors use while handling various media

Analyzing

- **Mashing:** it involves mixing of various data sources into a single and useful source. Apparently, this process seems very difficult but by extra choices and sites makes it more easy and achievable approach of evaluation.
- **Reverse-engineering:** this is similar to deconstruction and related about cracking without the poor implications related to this.
- **Linking:** this about developing and creating links among various documents and sites.
- **Cracking:** the crackers need to understand and operate the application which they are indented to crack and have to analyze its strengths and weaknesses after which exploit these.
- **Validation:** students having bulk of information with unawareness of authentication of that information are now in position to validate actuality of their understanding sources. For this, students need to be able to analyze the data source and make their judgments on this basis. to validation this base e the veracity of their understanding sources. To do this they have to be capable to analyze the data sources and make judgments based on these.
- **Tagging:** this is about to organizing, attributing and structuring online data. Students must be able to comprehend and analyze content of the pages which are ready to be tagged.

Evaluation

- **Blog commenting and reflecting:** blogs and video blogs usually facilitate the students for constructive criticism and reflective commenting.
- **Posting:** it involves posting comments to blogs, dialogue boards and discussions. The posting is structured and created to evaluate the topic rather just posting or commenting.
- **Moderating:** this involves high level of evaluation, the moderator has to be skilled so that he/she can evaluate posting comments and remarks and decide it's worth, value and appropriateness.
- **Collaborating and networking:** the communication is considered very significant that requires more interest in collaboration which further leads towards collective intelligence. This evaluates skills of individuals and their contributions. Networking is significant part of collaboration, interacting and speaking with each other.

Creating:

- **Programming:** this involves programming and starting of games and multimedia within control environment. Students are required to develop their programs that are related to their needs and interests.
- **Filming, animating, video casting, podcasting and remixing:** the students capture, create, mix and remix the content for designing new products. These are related to the availability of multimedia and editing tools.
- **Directing and producing:** it requires from students to be innovative and imaginative to produce new products.
- **Publishing:** publishing in media, digital format and online is a fast-growing interest. This demands a massive overview of content material and greater constriction on process

and product. It involves producing a video blog, running a blog, video running, and adding, modifying, and creating content in wikis. Building mash is also its one of ideas.

Knowledge Dimensions Defined in Digital Taxonomy

- **Factual Knowledge:** it refers to terminology, fundamental data, and significant points that students must understand to solve a main issue. This dimension is related to the ability which is common to precise disciplines.
- **Conceptual Knowledge:** is potential of classifications, principles, generalizations, theories, models, or structures pertinent to a targeted disciplinary discipline.
- **Procedural Knowledge**: refers to information or expertise that helps pupils to do whatever exact to a self-discipline, subject, or discipline of study. It additionally refers to methods of inquiry, very detailed or finite capabilities, algorithms, procedures, and exact methodologies.
- **Meta-cognitive Knowledge:** is the awareness of one's own cognition and specific cognitive processes. It is strategic or reflective knowledge about the right way to go about fixing problems, cognitive duties, to incorporate contextual and conditional knowledge and competencies of self.

Conclusion and Discussion

The Bloom's Taxonomy, initially, has proposed three main domains of learning to design more comprehensive instruction. In early 20th century a revised Bloom Taxonomy was proposed by Anderson and Krathwohl as response to new demands of educational theories and demands of new era (McGrath & Willcutt, 2022; DeWitt, 2014). Andrew Churches' digital taxonomy was developed as a step ahead in the typology of educational taxonomies in 2008 by adding multimedia and technological resources for Online instruction. The Blooms Digital Taxonomy can be used to support digital and online activities of distance education. It is relevant to all cognitive levels of Bloom's taxonomy and many of these advised activities have been tries in actual distance learning classrooms. Students are required to make use of new evolved digital literacy skills such as collaboration and validation of information (Munzenmaier & Rubin, 2013).

The undeniable necessity of establishing certainly defined objectives is very crucial in both traditional structured teaching environments and in modern class rooms where technology performs a significant role (McNeil, 2011). However, the results elaborated in this paper must be regarded as a small contribution to the system of planning in Online instruction as an alternative than a whole elaboration. Given the scope and the subject of this paper, simplest the tip of the iceberg has been offered and much broader and extra elaboration on the separate taxonomic levels and movements inside a digital context is required. Bloom's framework provided a systematic and easy to understand classification of learning levels. This provides a comprehensible and dominant device for determining educational objectives. This adequately measures students' capabilities regarding understanding of distinct phase of cognitive domain that is the centre for learning. This helps professors to develop students' learning outcomes and provide relevant instruction and guidance.

Having supposed student studying effects based on Bloom's Taxonomy helps to be certain that guide and comparison are safely aligned with the intended outcomes. It is perceived as

perfect and special because the other proposed taxonomies don't address goals to be set specifically in distance learning courses (Hegde & Deal, 2013). In other words, they cannot be used for the proper planning of distance education related courses as they can't be related to all of the viable pursuits provoked on the separate taxonomic stages inside a distance learning environment. To be more precise, primary interactive activities, such as networking, collaborating, sharing, searching and so forth, are lacking within the taxonomies. That is why it is usually stated that the emergence of Bloom's Digital Taxonomy is without a doubt a necessity to account for the new behaviors, actions, approaches, procedures and learning opportunities present in the distance learning class rooms utilizing technological know-how for all or some facets of the educating process. Even without specified elaboration, it's evident that an utterly new set of activities, exercise, tasks, tactics, methods, and many others could also be associated with distance learning instruction which results in the certainly major must show pupils in at today's class rooms situated on goals defined in line with that need (Abalkheel, 2022; Munzenmaier & Rubin, 2013).

Digital literacy is very important now a day especially for Online instruction, as technology helps to develop skills for work efficiently and live successfully. We have to just map a tool for targeted level of the hierarchy that enables students to use tools more than one stage. Bloom's work consistently encourages attention, application, study and discussion. It offers instructional framework that is greatly accepted. Bloom's work and taxonomies have passed the test of all times (Roberts, 2011). It has been used continuously as planning tool, a metric and a suggestion for new assessment tools. Even Marzano who has proposed an alternative taxonomy, recognizes and acknowledge the Blooms' contributions in this field as pioneer and exceptional. The Blooms' digital taxonomy is considered as most accredited tools that contribute to provoke new research, outline best assessment practice and instruction and offer more comprehendible language and framework for collaboration (Munzenmaier & Rubin, 2013). Whatever its shortcoming has been identified by various researchers, it is undeniable fact that Bloom's Taxonomy has beer all the tests of time especially in the 21st century of technology and online education.

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